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FAVORITES

- Exoplanet
- Multiple Star
- Multiple Planet
- Planet Frequency

GROUPS

title

Study the Influence of Stellar Companions On Planet Formation

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Wouldn't it be cool if we find something like Tatooine? Wait, how likely is it? And how does it compare to Planets around single stars?

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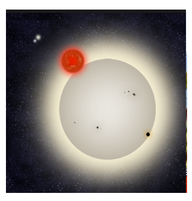
Compare the multiplicity of field stars and that for the planet host stars. If we see less multiple stars in the sample of planet host stars, then Tatooine may be less likely to exist than the Earth.



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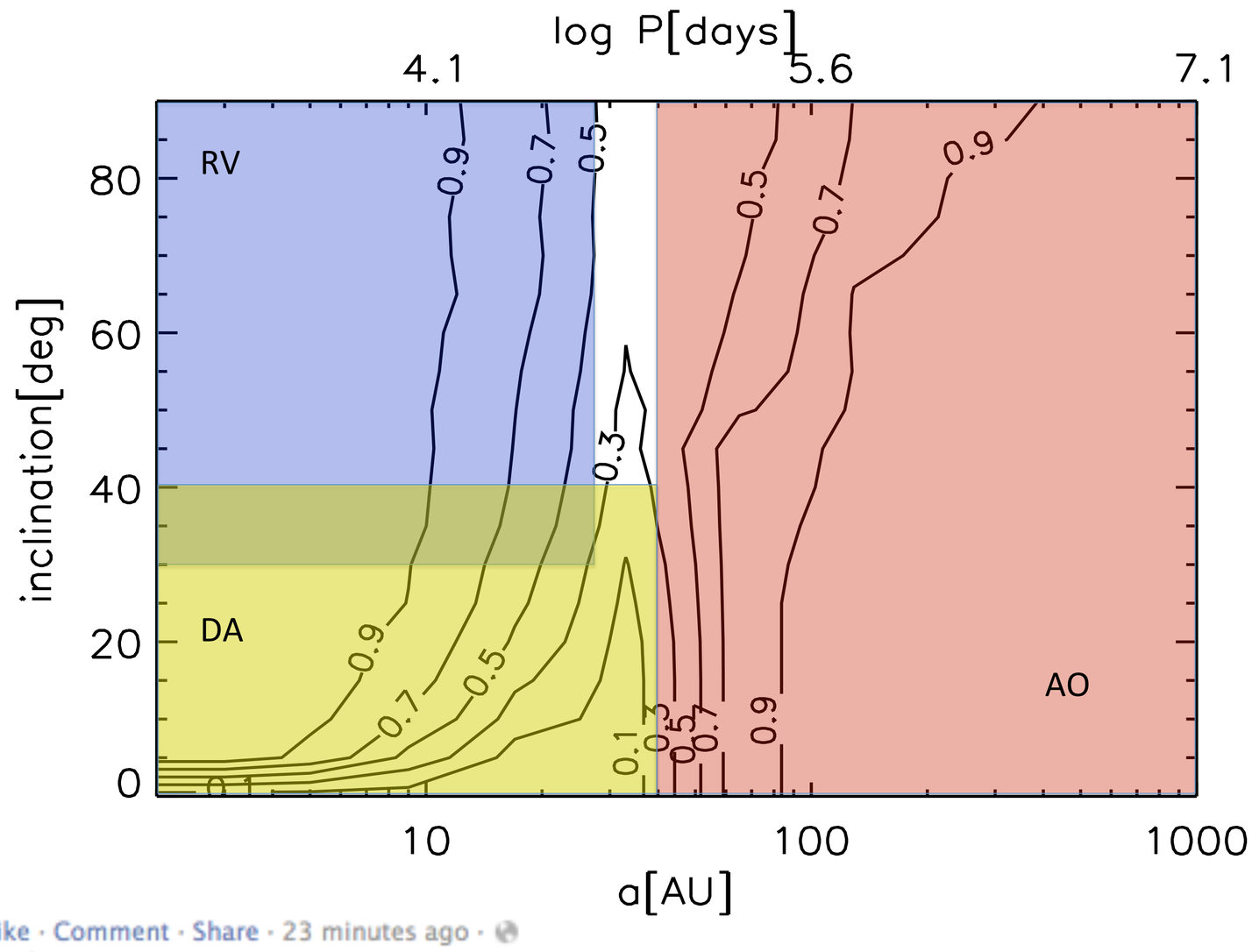
Since we know the multiplicity rate for field stars[1,2], the next step is to look for stellar companions around planet host stars.



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Above is a search completeness contour plot for a proposed stellar companion survey, we will use different methods to put constraint on the presence of a possible companion: 1, RV, radial velocity measurement; 2, AO, adaptive optics imaging; 3, DA, dynamical analysis, which sets constraints to companions leading to instable orbits for multi-planet systems. With the aids of these three methods, the survey will be a nearly complete survey that is sensitive to the entire *a-i* space.

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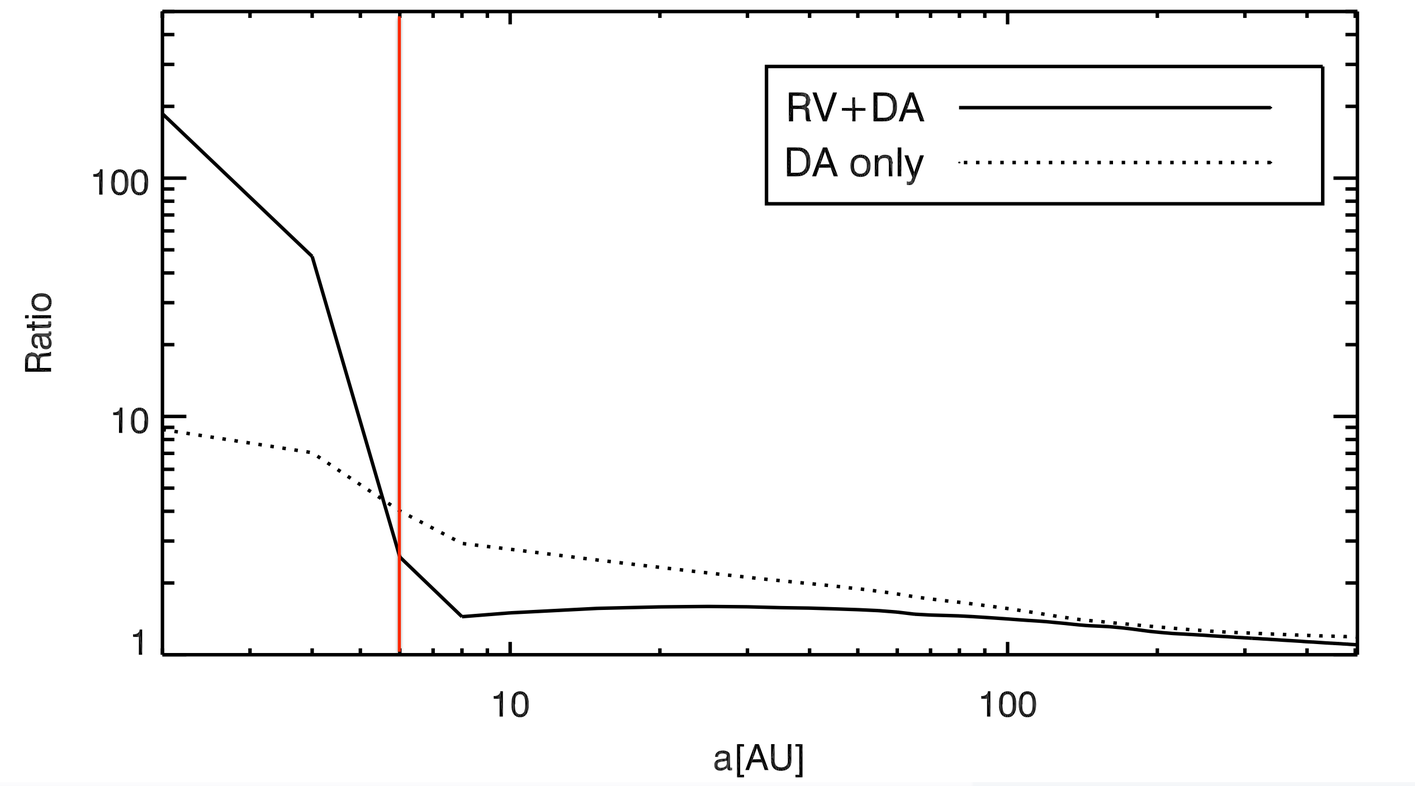
We started a pilot project[3] searching for companions around planet host stars using archival data. We selected *multi-planet* candidate systems from the Kepler Objects of Interest (KOI)[4]. The archival data is currently limited to RV data available at Kepler Community Follow-up Program (CFOP)[5] and Keck Observatory Archive (KOA)[6].



Ratio of field star multiplicity rate to planet host star multiplicity rate as a function of distance to central star. We found 23 KOIs with archival RV data and two have a long-term linear RV trend, KOI 5 and KOI 148, indicating the presence of a stellar companion. We used these 23 KOIs to study the ratio of multiplicity. Each KOI in our sample is assigned a probability of being a multiple star based on the search completeness. If it is a detection, then the probability becomes 1.

The sum of the probability is the number of multiple stars, the remainders are single stars. We found that the ratio of multiplicity is much higher than 1 for separations less than ~6 AU, indicating planets are preferentially discovered around single stars at these separations. If AO imaging is used, we can set constraints on companions at larger separations. As more KOIs are included, a complete picture is expected of planet formation around multiple stars.

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